# *SECTION 11 – STREAM BOTTOM DEPOSITS*

## SUMMARY

As a result of the 1998-1999 SWQB/NMED monitoring effort in the Jemez River Basin, several exceedances of New Mexico water quality standards for stream bottom deposits (SBD's) were documented on the Rio Cebolla, and Rito Peñas Negras. The Rio Cebolla was analyzed as two separate segments- Rio Cebolla (1) from its confluence with Rio de las Vacas to Fenton Lake and Rio Cebolla (2) from inflow to Fenton Lake to the headwaters. Figures 5.F.1 and 5.F.2 in Section 5 show the land use/cover and land ownership percentages for the Rio Cebolla. Similarly, Figures 5.I.1-5.I.2 show the land use/cover and land ownership percentages for Rito Peñas Negras (from its mouth on Rio de las Vacas to the headwaters). Detailed descriptions of these segments can be found in subsections F and I in Section 5 of this document.

## ENDPOINT IDENTIFICATION

### Target Loading Capacity

Overall, the target values for this TMDL will be determined based on 1) the presence of numeric criteria, 2) the degree of experience in applying the indicator, and 3) the ability to easily monitor and produce quantifiable and reproducible results. For this TMDL document target values for stream bottom deposits are based on numeric criteria. This TMDL is consistent with the State's antidegradation policy.

*Stream Bottom Deposits*
According to the New Mexico water quality standards (20.6.4.12.A NMAC), the general standard for stream bottom deposits (SBD) reads, "Surface waters of the state shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom."

The SWQB has compiled techniques to measure the level of embeddedness of a stream bottom in the *SWQB/NMED Protocol for the Assessment of Stream Bottom Deposits* (SWQB/NMED, 2000) in order to address the narrative criteria for SBD. The purpose of the Protocol is to provide a reproducible quantification of the narrative criteria for SBD. The impact of fine sediment deposits is well documented in the literature. The U.S. Environmental Protection Agency (EPA) document *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska* (USEPA, 1991) states that "An increased sediment load is often the most important adverse effect of.... activities on streams." This impact is largely a mechanical action that severely reduces the available habitat for macroinvertebrates and fish species that utilize the streambed in various life stages. An increase in suspended sediment concentration reduces the penetration of light, decreases the ability of fish or fingerlings to capture prey, and reduces primary production (USEPA, 1991).

The SWQB Sediment Workgroup evaluated a number of methods described in the literature that would provide information allowing a direct assessment of the impacts to the stream bottom substrate. A final list of monitoring procedures was implemented at a wide variety of sites during the 1998 monitoring season. These procedures included conducting pebble counts (a measurement of percent fines), stream bottom cobble embeddedness, geomorphology (using Rosgen techniques, 1996), and various biological measures.

The target levels involved the examination of developed relationships between embeddedness, fines, and biological score. Using existing data from NMED's 1998 sampling effort in the Jemez River Basin, a strong relationship ($R^2 = 0.75$) was established between embeddedness and the biological scores. A strong correlation ($R^2 = 0.719$) was also found when relating embeddedness to percent fines (Appendix C). There was only limited data for this correlation; however, previous TMDL segments (including those in the Cimarron Basin, the Jemez River, and the Rio Guadalupe) have established this relationship to be consistent.

These relationships show that at the desired biological score (at least 70, per the SWQB Assessment Protocol, 2000), the target embeddedness (for fully supporting a designated use) would be 45%, and the target fines would be 20%. Since this relationship is based on New Mexico streams, it was chosen as the target value for percent fines.

*Calculations*
No calculations were necessary because all loads are specified in percent fines.

The target loads for SBD are shown in Table 11-1.

**Table 11-1: Calculation of Target Loads**

| Location | SBD Standards** (% fines) | SBD Target Load Capacity (% fines) |
|---|---|---|
| Rio Cebolla (1) | 20 | 20 |
| Rio Cebolla (2) | 20 | 20 |
| Rito Peñas Negras | 20 | 20 |

**This value is based on a narrative standard. The background values for stream bottom deposits were taken from the *SWQB/NMED Protocol for the Assessment of Stream Bottom Deposits* (SWQB/NMED, 2000) located in Appendix C.

It was not possible to calculate background loads in this watershed. A reference reach, having similar stream channel morphology and flow, was not found. It is assumed that a portion of the load allocation is made up of natural background loads. In future water quality surveys, finding a suitable reference reach will be a priority.

**Table 11-2: Calculation of Measured Loads**

| Location | Measured SBD** (% fines) | SBD Measured Load (% fines) |
|---|---|---|
| Rio Cebolla (1) | 28 | 28 |
| Rio Cebolla (2) | 41 | 41 |
| Rito Peñas Negras | 27 | 27 |

**This value is based on a narrative standard. The background values for stream bottom were taken from the *SWQB/NMED Protocol for the Assessment of Stream Bottom Deposits* (SWQB/NMED, 2000).

**Waste Load Allocations and Load Allocations**

•*Waste Load Allocation*
There are no point source contributions associated with this TMDL. The waste load allocation (WLA) is zero.

•*Load Allocation*
In order to calculate the load allocation (LA), the WLA and margin of safety (MOS) were subtracted from the target capacity (TMDL) using Equation 2. The MOS is estimated to be 25% of the target load.

*Equation 2.* $WLA + LA + MOS = TMDL$

Results using a Margin of Safety (MOS) of 25% (as explained further in this section) are presented in Table 11-3.

**Table 11-3. Calculation of TMDL for Stream Bottom Deposits**

| Location | WLA (% fines) | LA (% fines) | MOS (25%) (% fines) | TMDL (% fines) |
|---|---|---|---|---|
| Rio Cebolla (1) | 0 | 15 | 5 | 20 |
| Rio Cebolla (2) | 0 | 15 | 5 | 20 |
| Rito Peñas Negras | 0 | 15 | 5 | 20 |

The load reductions necessary to meet the target loads were calculated to be the difference between the target load (Table 11-1) and the measured load (Table 11-2) and are shown in Table 11-4.

Achieving the target load for Rio Cebolla (1) would require a load reduction of approximately 46 percent. Using the measured percent fines value of 28 percent and a target of 15 percent fines (TMDL-MOS) a 46 percent overall reduction in sediment load can be calculated as necessary to achieve the target. Accordingly, Rio Cebolla (2) requires a load reduction of approximately 37 percent and Rito Peñas Negras approximately 56 percent.

**Table 11-4: Calculation of Load Reductions (% fines)**

| Location | Load Allocation (% fines) | Margin of Safety (MOS) (% fines) | Load Reductions (% reduction) |
|---|---|---|---|
| Rio Cebolla (1) | 15 | 28 | 13 |
| Rio Cebolla (2) | 15 | 41 | 26 |
| Rito Peñas Negras | 15 | 27 | 12 |

**Identification and Description of Pollutant Source(s)**

Pollutant sources that could contribute to each segment are listed in Table 11-5.

**Table 11-5: Pollutant Source Summary**

| Pollutant Sources | Magnitude (WLA+LA+MOS) | Location | Potential Sources (apply to three segments) (% from each) |
|---|---|---|---|
| Point: None<br>0% | 0 | -------- | |
| Nonpoint: 100%<br><br>Stream Bottom Deposits (% fines) | 20<br><br>20<br><br>20 | Rio Cebolla (1)<br><br>Rio Cebolla (2)<br><br>Rito Peñas Negras | Rangeland/Road Maintenance/Runoff<br><br>Agriculture/Road Maintenance/Runoff<br><br>Rangeland/Road Maintenance/ Runoff, Removal of Riparian Vegetation, Streambank Modification/Destabilization |

## LINK BETWEEN WATER QUALITY AND POLLUTANT SOURCES

Where available data are incomplete or where the level of uncertainty in the characterization of sources is large, the recommended approach to TMDL assignments requires the development of allocations based on estimates utilizing the best available information.

SWQB fieldwork includes an assessment of the potential sources of impairment (SWQB/NMED, 1999). The Pollutant Source(s) Documentation Protocol, shown as Appendix B, provides an approach for a visual analysis of the source along an impaired reach. Although this procedure is subjective, SWQB feels that it provides the best available information for the identification of potential sources of impairment in this watershed. Table 11-5 (Pollutant Source Summary) identifies and quantifies potential sources of nonpoint source impairments along each reach as determined by field reconnaissance and assessment.

## MARGIN OF SAFETY (MOS)

TMDLs should reflect a margin of safety based on the uncertainty or variability in the data, the point and nonpoint source load estimates, and the modeling analysis. For this TMDL, there will be no margin of safety for point sources, since there are none. However, for the nonpoint sources the margin of safety is estimated to be an addition of 25% for stream bottom deposits (SWQB/NMED, 2000) to the TMDLs, excluding background. This margin of safety incorporates several factors:

•*Errors in calculating NPS loads*

A level of uncertainty exists in the relationship between embededness, fines, and biological score. In this case, the percent fines are based on a narrative standard and there are also potential errors in measurement of nonpoint source loads due to equipment accuracy, time of sampling, and other factors. Accordingly, a conservative margin of safety for stream bottom deposits increases the TMDL by 25%.

•*Errors in calculating flow*

Flow estimates were not needed for calculations, thus do not warrant additional MOS.

## CONSIDERATION OF SEASONAL VARIATION

Data used in the calculation of this TMDL were collected during spring, summer, and fall of 1998 in order to ensure coverage of any potential seasonal variation in the system. It is assumed that if the critical conditions are met, coverage of any potential seasonal variation will also be met.

## FUTURE GROWTH

Estimations of future growth are not anticipated to lead to a significant increase for stream bottom deposits that cannot be controlled with best management practice implementation in this watershed.